

# 電漿配向技術應用於扭轉向列型液晶盒之研究

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## 摘要

液晶配向的優劣對液晶顯示器的品質有很大的影響。傳統的配向法 rubbing 會產生靜電、塵屑污染等問題，均勻性也不佳，非接觸式配向可以改善這些缺點。而非接觸式配向中的光配向，低配向穩定度與不足的錨定能是仍需克服的問題。而離子束配向的成本高昂、設備複雜，且有離子槍壽命問題。本計畫使用電漿束配向法，不但沒有接觸式配向 rubbing 所產生的問題，及其他非接觸式配向的缺點，它還具有大尺寸面積配向及均勻性良好等優點，是一項極具發展潛力的技術。

在本論文中，我們選用的配向方式為電漿配向。我們將探討電漿配向過後的表面型態、預傾角及光電特性。改變電漿入射角及掃描次數對表面型態及光電特性的影響也將會分析。我們發現與摩擦配向相比，使用電漿配向的扭轉向列型液晶盒在暗態會產生漏光。因為在電漿配向過程中牽涉離子轟擊，而由 NEXAFS 的量測結果顯示突出表面的羰基(carbonyl groups)被嚴重破壞，進而使錨定能減少及影響液晶盒光電特性。在電漿配向後，使用氧氣後處理修復表面的羰基。經由氧氣後處理的向列型液晶盒暗態漏光可成功消除。

# **The Study of Plasma Treated Alignment for Twisted Nematic Cells**

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## **Abstract**

The liquid crystal alignment plays a very important role to the LCD's quality significantly. The traditional alignment rubbing method has the problem of static electricity, dust contamination, and uniformity issue. Non-contact alignment method can improve these disadvantages. But in the non-contact alignment method, the photo alignment has the problem of poor alignment stability and low anchoring energy. Furthermore, the cost in ion beam alignment is expensive, the equipment is complicated, and has the problem of ion gun lifetime compared with the plasma beam alignment. As a result, plasma beam alignment is the best solution of these possible candidates.

In this thesis, plasma beam alignment will be selected for the alignment technique. The surface morphology, pretilt angle, electro-optic characteristics after plasma beam treatment will be investigated. We found that the plasma alignment prepared TN cell has light leakage at the dark state compared with rubbed PI alignment cell. Because of ion bombardment during plasma alignment process, the NEXAFS data suggested that the out of plane carbonyl groups have been damaged seriously. It might cause the reduction of polar anchoring energy, and influence the EO characteristics of LC cell. The oxygen post-treatment is adopted to repair the surface polar functional groups. The light leakage can be suppressed successfully for the TN cell with oxygen post-treatment.

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